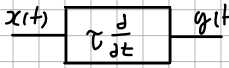
Идеальный дифференциатор



$x(t) = \hat{x} e^{j\omega t}$

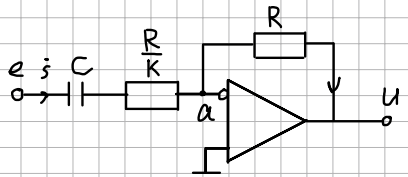
$y(t) = \hat{y} e^{j\omega t}$

$y(t) = \tau \frac{d}{dt} x(t) = \tau \hat{x} j\omega e^{j\omega t} \Rightarrow \hat{y} = j\omega\tau \hat{x}$

$\Rightarrow H(j\omega) \triangleq \frac{\hat{y}}{\hat{x}} = j\omega\tau$

$H(s) = s, \quad s = j\omega\tau$

Дифференциатор на ОУ



ПВЗ: $U_a = 0$

$e - \dot{s}\left(\frac{1}{j\omega C} + \frac{R}{K}\right) = 0$

$\Rightarrow e = \dot{s}\left(\frac{1}{j\omega C} + \frac{R}{K}\right)$

$U = -\dot{s}R \Rightarrow \dot{s} = -\frac{U}{R}$

$e = -\frac{U}{R}\left(\frac{1}{j\omega C} + \frac{R}{K}\right) = -U\left(\frac{1}{j\omega RC} + \frac{1}{K}\right)$

$s = j\omega\tau, \quad \tau = RC, \quad H(s) = \frac{U}{e}$

$H(s) = -\frac{1}{\frac{1}{s} + \frac{1}{K}} = -\frac{s}{1 + s/K}$